

## CMPT 250

## Midterm 1

55 minutes  
Book

Closed  
Dec. 1, 2000

## Marks

7 1. The objective is to do a timing analysis of the routines below. They call the function t, which is an INTEGER function. Suppose that the function t requires time  $O(q)$ .

a : REAL i

local i : INTEGER  
do

from i := 1  
until i > n  
loop

Result := Result + t(i)\*b(i)  
i := 2 \* i

end

end

b (j : INTEGER) : REAL is

local i : INTEGER  
do

from i := m  
until i < l  
loop

Result := Result + j/t(i)  
i := i - 1

end

end

8 2. In the context of designing a routine for a class, what is meant by "Design by Contract"? How is the contract specified in the code for the routine? If the routine is redefined in a descendant class, how can this influence the specifications of the contract?

8        3. Suppose that you are designing an object-oriented payroll system for some small company. There are three types of employees, tellers, shelve stockers, and managers, so classes have been designed for all three. Each type has a different scheme for computing their salary. However, in all cases, the salary is computed from attributes within the class, so the salary computation is set up as a function with no arguments.

There is to be a container of employees, and the objective is to design the system to make it easy to print out the salary of every employee. Describe how you would design this part of the system. Note that no code is needed, but give a detailed description of your design.

12        4. An application is being built which uses a symbol table. The symbol table is a keyed dictionary with the key of a key-item pair being the name of a variable and the item being the value associated with the variable. Assume that all values are integer. The dictionary to use for the symbol table is `ARRAYED_P_KEYED_DICTIONARY_UOS [K, G]`. Rather than using the `out` defined in that class, an `out` is wanted that formats the string as follows:

The value of `a` is 4

The value of `b` is 7

...

where `a` is a variable with value 4 and `b` is a variable with value 7.

Give the Eiffel code to define the class `SYMBOL_TABLE`. Note that `ARRAYED_P_KEYED_DICTIONARY_UOS` is an iterated class and you should use the iterator in your routine `out`. To aid you, the inheritance diagrams for `P_KEYED_DICTIONARY_UOS` and `KEYED_LINEAR_ITERATOR_UOS` are given at the end of the exam. (These were copied from pages 218, 219, and 222 of the text.)

15        5. Consider the rental problem that was used in assignment #5. From time to time, the manager needs to purchase new items to be rented. For certain major items, it can be hard to find reliable suppliers for the items. Thus, the manager wants to keep track of suppliers for such major items.

- a. Give the sequence diagram for the manager task of recording the information for another supplier of some major item. Assume that an object of type `ADD_SUPPLIER_COMMAND` has already been created and is being executed. Your sequence diagram should start at the time execution begins in this command.
- b. What new container or containers are implied by the sequence diagram? What data structures would you use for them?

Total 50

The end